FIRST SERIES.

LIST OF APPARATUS AND MATERIALS.

[The references are to the notes which immediately follow the list.]

Narrow wooden laths, about 5″ × ¼″. (*Note A.*)
Beads. (*Note B.*)
Small scissors, with rounded ends. (*Note C.*)
Flat wooden rules, 1 foot long, divided into half-inches.
Circular disc, 3″ diameter, preferably of metal.
Square, 3″ side, preferably of metal.
Large plain white paper squares, 6″ side.
Small plain white paper squares, 4″ side.
Coloured (various) paper squares, 4″ side.
Ditto, gummed at the back. (*Note D.*)
Paper strips, white, 12″ long, half-inch wide.
Squared paper for drawing (quarter-inch squares), pieces 5″ square.
Short lengths (about 4″) of various-coloured wools in small bag. (*Note E.*)
Teacher's corresponding series of wools in small skeins.
Soft copper or brass wire (about No. 26) in small coils of about 7 feet. (*Note F.*)
Pieces of planed wood, about 3″ square, ½″ thick.
Rings, brass or black, about 1¼″ diameter.
Modelling clay. (*Note G.*)
Earthenware jar with lid, for keeping moist clay.
Small modelling boards, about 11″ × 7″.
Simple wooden modelling tool. (*Note H.*)
Small sponges.
String, thin for cutting clay, and some thicker for Exercise IX.
Lead pencils.

NOTES ON THE APPARATUS AND MATERIALS AND THEIR USE.

(*A*) The *laths* should be of wood which breaks easily and sharply across, not leaving very irregular edges. Narrow strips of paper might be sometimes used instead of the laths, but they are not so convenient.

(*B*) The *beads* should be of fairly large size, so that they may readily be handled and moved. They should also have a flat side, so as to stand steadily on the table or desk.

If the slope of the desks is so great that much difficulty is found in getting the children to place the beads so that they do not roll off, the exercise might be performed on a modelling board or slate laid on the desk and made as nearly level as possible by placing a book under one edge; or *small* flat buttons or flattened shot might be used on the desks instead of the beads; or the laths or rings might be laid on a slate placed on the desk in the usual way, and the children told to mark points with their slate pencils instead of laying beads.

(*C*) Small *scissors* with rounded ends can be had for about one penny the pair, and have the advantage that young children cannot hurt themselves with them. They have the disadvantage usually of working somewhat stiffly at first, and care must be exercised when cutting paper with them not to take the cut quite to the end of the scissors, as the ends tear the paper.

(*D*) The *coloured paper squares* should have a smooth glazed surface, so as to prevent them from being readily marked by the fingers. Those which are coated with gum at the

back are somewhat brittle, and, when folding and creasing them, it should be done with the coloured surface inside.

In mounting the gummed squares on other paper, the children should be made to lay them in position before moistening the gum; and it is then sometimes advisable to mark one or two points at the edges or corners as guides in laying them down again when wet. They may, however, be stuck down by holding them in position, when correctly laid, and raising one corner or edge at a time, moistening it with the sponge and fastening it down before raising another part. Or the paper may be removed, and the whole gummed face wetted by dabbing (*not rubbing*) it with the wet sponge.

The children might be allowed to use pieces of paper (old exercise paper, etc.) to lay over the coloured sheets while rubbing them to fasten them down.

The packets of gummed paper should be kept in a dry place, or they are liable to stick to each other.

(*E*) The pieces of *wool* should be thick ("fleecy" or "double Berlin"), and about 4 inches long. They should comprise black, white, and two or three shades of red, yellow, green, and blue—in all about twenty specimens. (A special series of wools suitable for these exercises, and used also to illustrate the lessons on colour in the author's "Elementary Science Lessons," has been prepared by Messrs. Philip, Son, and Nephew, South Castle Street, Liverpool. The same firm has also arranged to supply all the other apparatus required for these exercises.) Each child should have a set of wools, which may very conveniently be kept in small calico bags.

A set of small skeins of corresponding colours should be provided for the teacher to use for class illustration.

The children, when sorting the wools, should be provided with a piece of clean white paper on which to lay the pieces, so as better to show the colours.

(*F*) The *wire* must be thin and soft, so that the children may readily work it with their fingers. It may be cut into

lengths with the scissors. Care should be taken to prevent the wire getting into bends or kinks, as it would then be difficult for the children to straighten it out again properly. If it should get somewhat bent, it may be straightened by drawing it over a rounded slate-frame.

(*G*) The *modelling clay* recommended is that used by artists, and is best bought in a state of fine dry powder. If obtained in dry lumps, it will be well to reduce them to powder, with a large pestle and mortar if possible. The clay is of a light grey colour, and should be free from gritty particles.

The powder is prepared for use by mixing it with water, just as in making dough, mixing the powder and water well together with the hands, or with a large spoon or stirrer. When properly prepared it will be soft, but not sticky; if it sticks at all to the fingers it is too wet, and some more dry powder should be worked into it. If the bowl or board on which the clay is being prepared is dusted with some of the dry powder the clay will not so readily stick to the article.

When the clay has been once properly made up, it may be kept in good condition for some time by enclosing it in an earthenware jar covered with a lid of the same material. If it is found that the clay is getting somewhat too dry, a damp duster laid in the jar along with the clay will probably soon make it all right.

The pieces of clay, when being worked in the hands, tend to become dry, especially if too small pieces are used. (As a rule, each child should be given for these exercises a piece of clay sufficient to make a ball from 1½ to 2 inches in diameter, or about as much as would be made from a quarter of a pound of powder.) If it is found that the clay in the process of modelling is getting too dry, the children might be provided with a damp sponge with which to slightly moisten their hands occasionally—not, however, making them so wet that the clay will stick to them. (It is hardly necessary to say that the sponges

should be well rinsed before being used again for paper mounting.)

The modelling should be done on special boards or old slates (without frames), and it is found that, if reasonable care be taken, neither the desks nor the children's clothes need be soiled by the work.

The moist clay may readily be cut with a knife or with a piece of thin string. When the children have to cut the clay in the course of an exercise, they should be supplied with a piece of thin string about six inches long.

(*H*) The *modelling tool* is not much required in the simple exercises of the first and second series, almost all the work being done with the finger and thumb. When a cube or other figure with flat sides is to be made, the clay should be pressed or slightly struck against the modelling board; or the small square wooden blocks provided for the purpose may be used, especially where pairs of flat sides parallel to each other are to be produced.

Perhaps the most useful general tool is the one shaped as in the figure.

Exercise I.

PAPER FOLDING, TEARING, AND LAYING.

MATERIALS.—*Large white paper square.*

Fold paper down middle, and crease well.

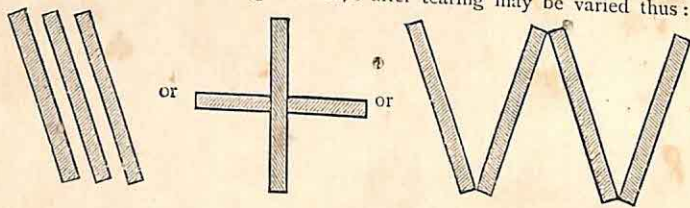
Tear paper along crease. (The creased paper should be held in both hands, with the ridge of the crease towards you, and the tearing gradually started. Then the paper may be laid flat on the desk and one part held down with the hand while the other is torn off.)

Repeat folding and tearing to get eight equal long strips.

Lay strips on desk parallel to each other and at approximately equal distances (Fig. 1).

Take up half the strips, and lay parallel to and equidistant from each other, but perpendicular to the other strips (Fig. 2).

Lay one set over another to form a grating (Fig. 3).

NOTE.—If, as is probable, it is found necessary to repeat this exercise two or three times before the children learn to tear the paper neatly, the manner of laying the strips after tearing may be varied thus:

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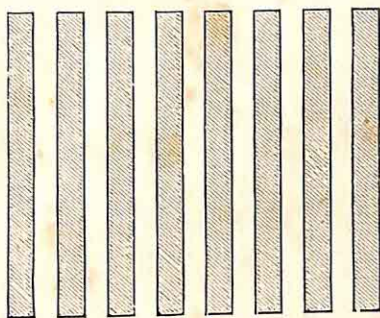
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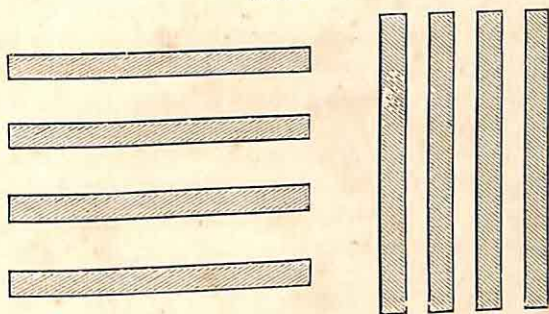
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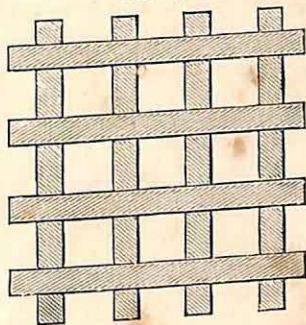

Exercise II.

LATH AND BEAD LAYING—ANGLES.

MATERIALS.—*Six wooden laths, three beads.* (See Notes A, B, p. 4.)

Lay laths parallel to each other and equidistant (Exercise I., Fig. 1).

Lay three laths end to end in a straight line.

Lay other three laths in straight line parallel to last (Fig. 1).

Lay two laths inclined to each other to form an angle, and lay a bead *in* the angle.

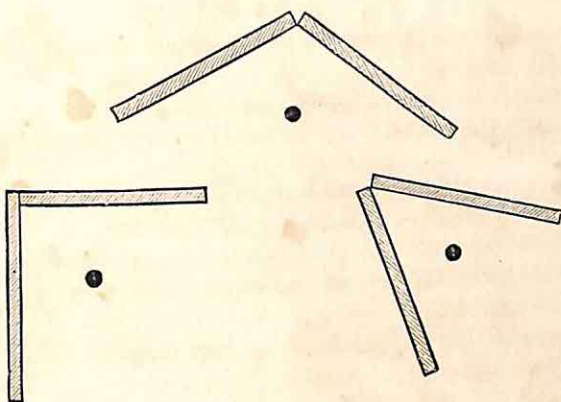
Lay two laths to form a right angle.

Lay another pair to form an angle less than a right angle (acute angle); and a third pair to form an angle greater than a right angle (obtuse angle).

Lay a bead in middle of angle, *i.e.* on line bisecting angle (Fig. 2).

Lay laths to form letters T, H, W, M, A, etc. (Note various angles in letters; and such facts as that upright of T is opposite middle point of cross-piece, that outer sides of M are parallel to each other, but not those of W, etc.)

FIG. 1.

FIG. 2.

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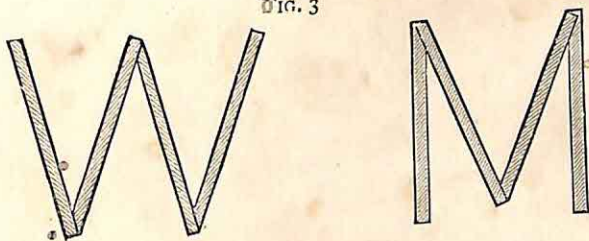

Exercise III.

PAPER FOLDING AND TEARING—SQUARE AND TRIANGLE.

MATERIALS.—*Small paper square (white or coloured).*

Examine paper square, and note four equal sides and four right angles.

Fold square accurately along one diagonal (Fig. 1). (Note which sides are now equal, and which angles are not right angles.)

Fold again, laying one small angle on the other (Figs. 2, 3). (Again compare sides and angles.)

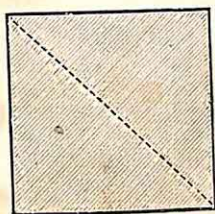
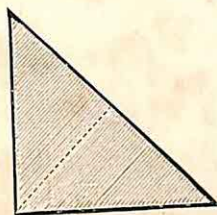
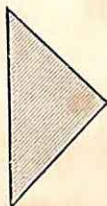
Crease well, then open out the square, and note the crease lines dividing the square into four equal triangles.

Tear carefully along creases.

Lay the triangles on each other to show equality.

Lay the triangles with their four long sides in a straight line (Fig. 4).

Lay the triangles in similar positions, with four short sides in straight line (Fig. 5).

FIG. 1. FIG. 2. FIG. 3.

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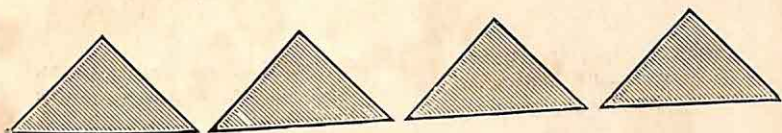
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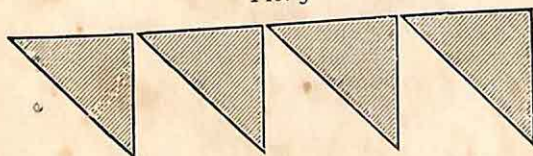
Exercise IV.

PAPER FOLDING, CUTTING, AND LAYING

MATERIALS.—*Small paper square* (*white or coloured*).

Fold square as in Exercise III.
Crease well, open out, and slightly press out crease lines.
Cut along crease lines with scissors. (*See Note C, p.* 4.)
Compare triangles with each other, and note that one side of each is longer than the other sides.
Lay triangles together to form original square. (Note that the long sides of the triangles form the sides of the square.)
Slightly separate the triangles to form symmetrical pattern (Fig. 1).

NOTE.—The latter figure might—in another lesson, if necessary—be drawn on a slate, either freehand or with ruler. Also the children might be allowed to lay another pattern of their own design, *e.g.* Figs. 2, 3, 4.

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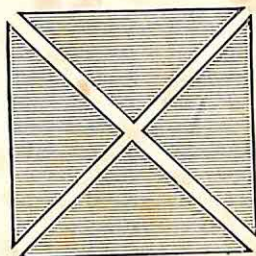
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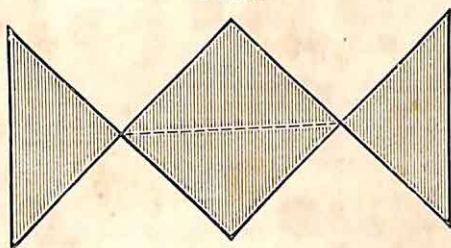
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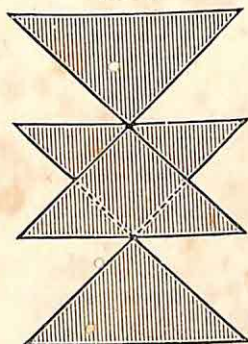
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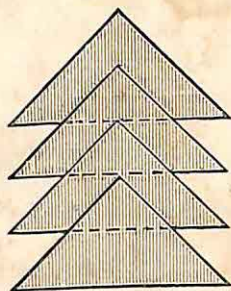
Exercise V.

LATH LAYING—TRIANGLES.

MATERIALS.—*Eight wooden laths.*

Compare the laths together (set them together with one end resting on desk) to show that all are of equal length. (Make them equal by breaking, if necessary.)

Lay four laths together to form a square.

Lay another lath along diagonal of square (Fig. 1). (Note that the diagonal is longer than a side.)

Remove two laths to leave an incomplete triangle (Fig. 2).

With three other laths form complete triangle (Fig. 3), and compare this with incomplete triangle. (Note sides of this triangle are equal; one side of other triangle, if completed, would be longer than other sides; note also that there is no right angle in complete triangle.)

Take away the laths forming the incomplete triangle, leaving the other one untouched.

Hold a lath by its estimated middle point; break there and test the two parts to see if equal.

Try to make triangle with one whole lath and the two halves. (Note, therefore, that not *any* three lines will make triangle.)

Make triangle with two whole laths and one half (Fig. 4).

Break small piece (about an inch) off one lath, and with three unequal pieces (*i.e.* a whole lath, half lath, and the lath which has had a small piece broken off) form a triangle (Fig. 5).

Mix all the laths and pieces together, and then select those required to form respectively (1) a triangle with three sides equal; (2) with only two sides equal; (3) with all sides unequal.

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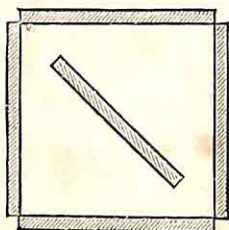
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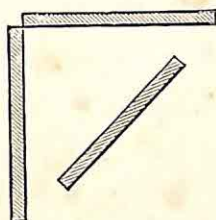
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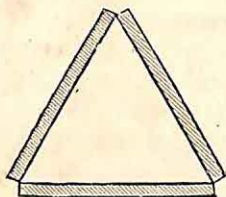
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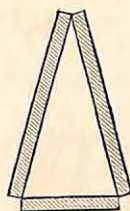
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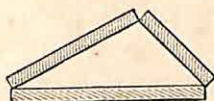
Exercise VI.

PAPER FOLDING, CUTTING, AND LAYING—SQUARES.

MATERIALS.—*Small white paper square ; metal square ; lead pencil ; scissors.*

Trace outline of model square on paper. (See that pencil is sharp, and that the point is kept close to the edge of the model in drawing the outline.)

Cut out square along ruled outline, taking care to get corners accurate.

Fold square twice at right angles to form four squares ; crease along folds, and then open out sheet (Fig. 1).

Cut carefully along crease-lines, after first partly flattening them.

Compare the four squares with each other as to size and shape.

Lay the squares at equal distances with bases in straight line (Fig. 2).

Lay the squares at equal distances with diagonals in straight line (Fig. 3).

Arrange squares to form symmetrical pattern, to design of children themselves (Figs. 4, 5, 6).

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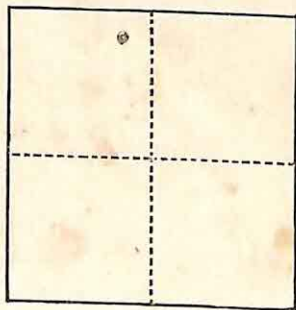
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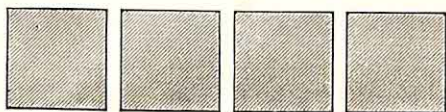
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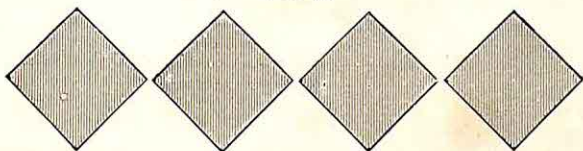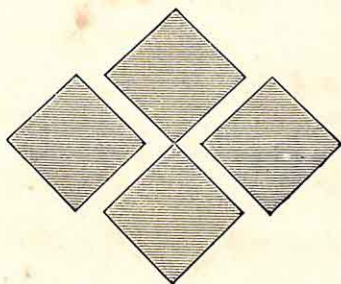
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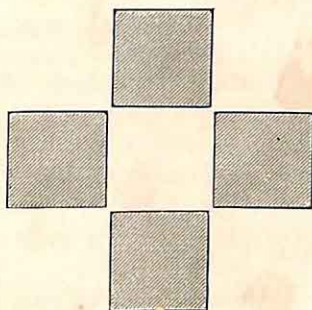
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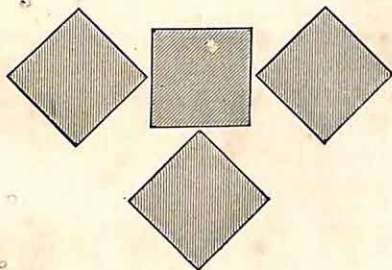

Exercise VII.

BEAD LAYING AND PAPER CUTTING.

MATERIALS.—*Small paper square; scissors; ruler; lead pencil; five beads.*

Lay bead on estimated middle point of each edge of paper square.

Lay another bead in estimated middle point of square. (Note that central line should be in line with beads on opposite sides.)

Remove beads, fold and crease square along two middle lines at right angles as in last exercise.

Open out square, flatten, and lay on desk (Fig. 1).

Lay bead as directed in middle of "upper left-hand square," etc.

Lay beads at bottom corners of square and at middle point of upper side.

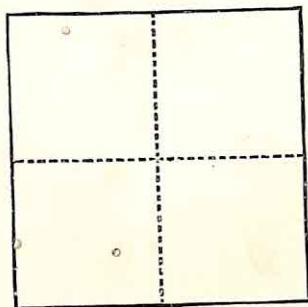
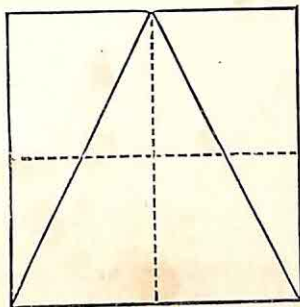
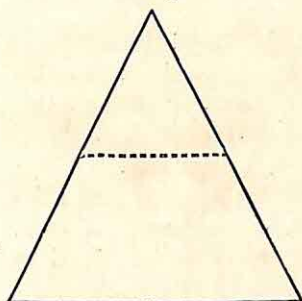
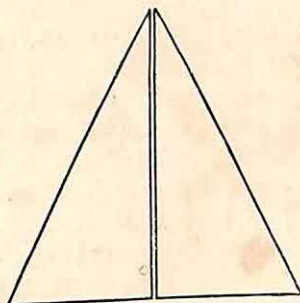
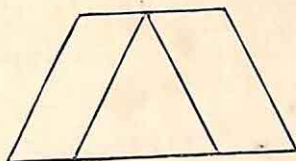
Rule lines joining points last indicated (Fig. 2).

Cut out the central triangle (Fig. 3).

Lay together other two pieces to form triangle similar and equal to first (Fig. 4).

Cut off small triangle marked by crease-line across larger one.

Lay small triangle symmetrically on portion from which cut (Fig. 5). (If children use coloured paper, a child might change the small triangle with his neighbour for one of different colour.)

FIG. 1.
FIG. 2.
FIG. 3.
FIG. 4.
FIG. 5.

Exercise VIII.

MEASUREMENT.

MATERIALS.—*Paper strip* (*about* 12" × ½") ; *foot rule ; lead pencil.*

Measure and mark point on each edge of paper distant one inch from one end.

Rule line joining the marked points and fold paper on line.

Compare this folded inch with length of finger joints, width of rule, etc.

Carefully fold whole strip in inches (folding backwards and forwards alternately) ; open out, and mark in numbers with pencil. (The inch marks are found by folding rather than with the rule, as an exercise in accurate folding.)

Mark in points indicating half-inches by help of rule.

Measure with strip (and also with rule) length of fingers, sides of book or slate, width of desk, circumference of wrist, etc. (Note advantage of using strip that will bend in measuring round wrist, etc.)

Exercise IX.

STRING MEASUREMENT AND DIVISION.

MATERIALS.—*Piece of string over* 12" *long; rule; scissors.*

Cut piece of string to exact length of twelve inches by the rule.

Lay out string on desk and place finger on estimated middle point.

Take up string by estimated middle point, and double it to test if correct.

Crease string at true middle point (found by doubling), measure each half with the rule, and tie knot at centre.

Similarly find middle point of each half, first estimating it, then measuring and tying knot.

Fold string into three equal parts; cut there, and measure each part. (If the string is rather thick, the knots will take off appreciably from the length of each piece as calculated.)

Unravel one piece of string (if not too thin and tightly twisted) to show its component fibres.

Exercise X.

CLAY MODELLING—BALL, CYLINDER, AND DISC.

MATERIALS.—*Moist clay (sufficient to make ball* $1\frac{1}{2}$ *to 2 inches diameter); modelling board; damp sponge. [Large sphere and cylinder, as used for model drawing, in front of class.]*

Roll the clay (*see Note G, p.* 6) on modelling board, or between the hands, to form well-shaped ball or sphere (Fig. 1). (Lay the clay sphere on the board, and show that it rolls readily in any direction.)

Roll out clay on board to form cylinder; flatten the ends and set cylinder to stand vertically (Fig. 2).

Flatten the clay to form an approximately circular disc (Fig. 3). (Compare with coin or metal disc used in exercises.)

[If there is time, when the exercise is well done, let children model clay into form of any object they choose.]

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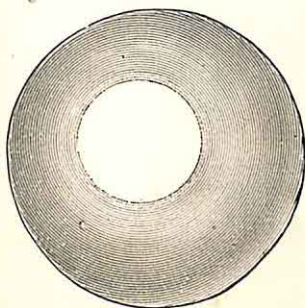
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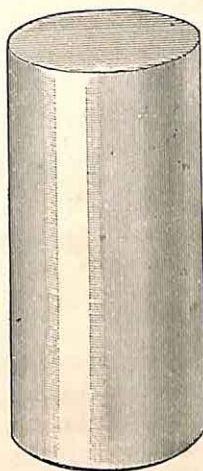
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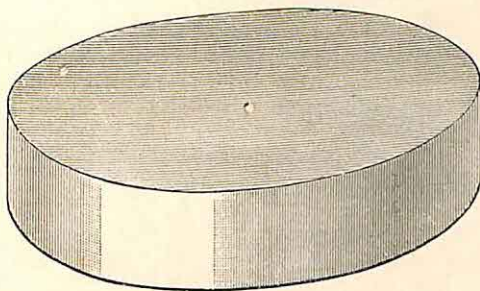
Exercise XI.

CLAY MODELLING—BOWL.

MATERIALS.—*Moist clay; modelling board; thin string (about six inches long) for cutting clay; damp sponge.* [*As a model use an orange cut in two; one half having the pulp carefully removed, leaving the peel unbroken.*]

Roll the clay into a sphere (Fig. 1).

Cut sphere with thin string into two hemispheres. (Compare the hemispheres with each other and with original sphere.)

Lay one hemisphere on its flat face, other on its curved part (Figs. 2, 3). (Note how easily latter rocks from side to side, while former stands steadily.)

Model one hemisphere into a hemispherical bowl, similar to peel of half-orange (Fig. 4).

[If there is time, attach simple handle to bowl, first wetting points of contact, and with remainder of clay let children model any object they choose.]

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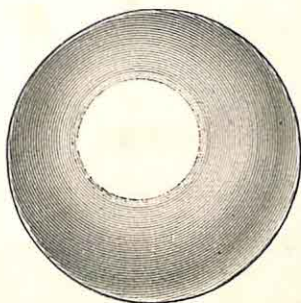
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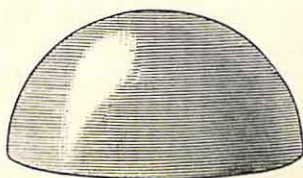
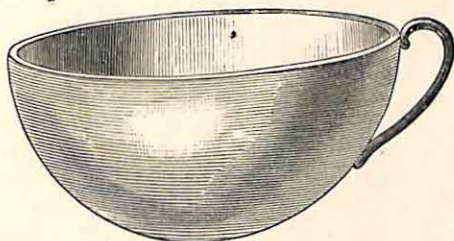


FIG. 3.

FIG. 4.

Exercise XII.

CLAY MODELLING—REPETITION.

MATERIALS.—*Moist clay; modelling board; thin string for cutting clay; damp sponge.*

Roll clay into sphere.
Cut sphere with string into two hemispheres.
Cut each hemisphere into two equal parts.
Roll each of four pieces into small sphere and lay together to compare sizes.
Retain one piece in form of sphere, make second into cylinder, third into bowl, and fourth into object chosen by child himself. (Note that there is an equal quantity of clay used for each object.)

Exercise XIII.

PAPER CUTTING AND BEAD LAYING—CIRCLE.

MATERIALS.—*Small white paper square; scissors; nine beads; model circular disc (metal); lead pencil; rule.*

Lay circular disc symmetrically in middle of paper square.
Outline circle on paper. (See that point of pencil is kept close to model.)
Cut carefully along the outlined circle.
Lay paper circle on desk. (Note that it looks the same in all positions on desk, having no corners.)
Lay bead in estimated centre of circle.
Lay four beads on circumference at opposite points, and note if all are at same distance from central bead (Fig. 1).
Lay other four beads on circumference half-way between first four.
Take up beads from circumference, and lay row of five across circle as a diameter (Fig. 2). (Note two semicircles.)
Lay other four to form diameter at right angles to first (Fig. 3). (Note four quarter-circles and four right angles.)
Fold circle along several diameters and crease.
Open out creased circle and measure with the rule the various diameters creased to show all equal (Fig. 4).

FIG. 1 FIG. 2.

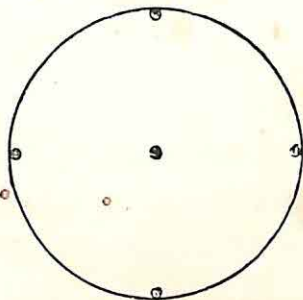
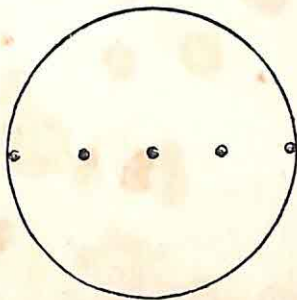
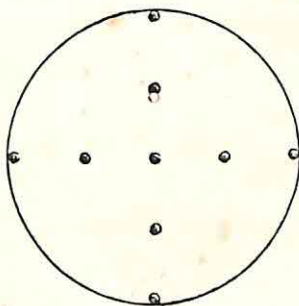
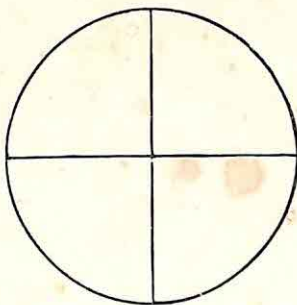



FIG. 3. FIG. 4.

Exercise XIV.

LATH AND BEAD LAYING—CIRCLE.

MATERIALS.—*Four laths ; rule ; lead pencil ; eight beads ; slate and pencil.*

Measure the laths to see if all of equal length, and make equal if necessary.

Find middle point of each lath and mark with pencil.

Lay two laths crossing at middle points at right angles (Fig. 1).

Lay other two laths to bisect angles between first two, and crossing at their middle points (Fig. 2). (Note that from central point portions of equal length project in various directions.)

Lay beads in spaces between ends of laths to outline a circle (Fig. 2).

Break one lath at middle point and use as ruler.

From central point on slate rule lines in various directions, equal in length to half-lath.

Fill up spaces between ends of lines with dots to outline circle (Fig. 3).

FIG. 1.

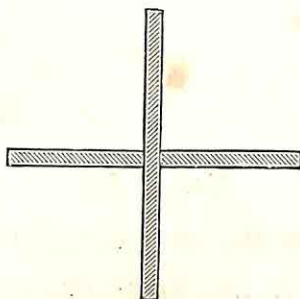



FIG. 2.

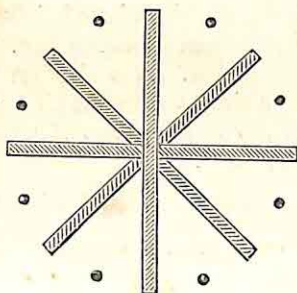
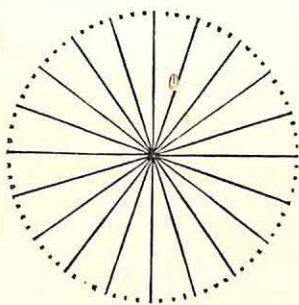
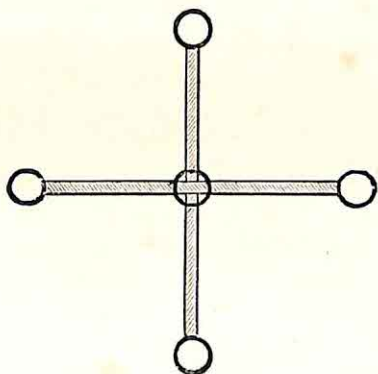



FIG. 3.

Exercise XV.

LATH AND RING LAYING—CARDINAL POINTS.

MATERIALS.—*Two laths ; five rings ; slate and pencil ; ruler.*

Lay two laths crossing at estimated middle points at right angles (without measurement).
Lay ring symmetrically at point where laths cross (see figure).
Lay ring symmetrically at ends of each lath.
Draw figure similar, and of same size, on slates, ruling the lines and using a ring to trace the circles.
Print letters N, S, E, W inside circles of drawing.
Draw same figure freehand.

NOTE.—Many other exercises in laying laths, beads, and rings, besides those described in the exercises, will readily suggest themselves ; *e.g.* with laths and beads laying a semicircle, laying a square with beads, etc.

Exercise XVI.

RING LAYING.

MATERIALS.—*Slate and pencil; rule; six rings.*

Rule straight line across slate near the top.

Lay six rings touching each other and touching the line.

Mark dot (or small cross) with pencil at estimated centre of each ring (Fig. 1).

Remove rings and note that dots are at equal distances from each other and from line.

Rule second line and place six dots, without measurement, as nearly as possible in similar position to the others (Fig. 2).

Test positions of estimated points by laying rings.

Rule third line on slate, and place six dots in position by measurement, and again lay rings.

Rule line lengthwise on slate and lay rings in pairs on either side of line, touching each other (Fig. 3).

Mark dots in centre of rings, and remove rings.

As before, rule lines and place dots in similar positions, first without, then with, measurement.

FIG. 1.

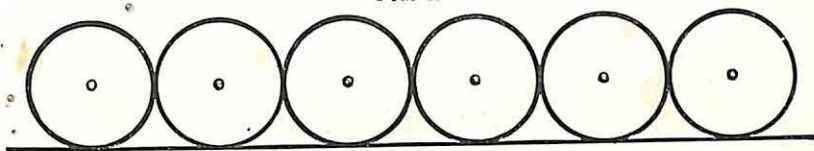



FIG. 2.

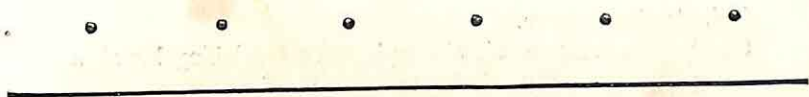
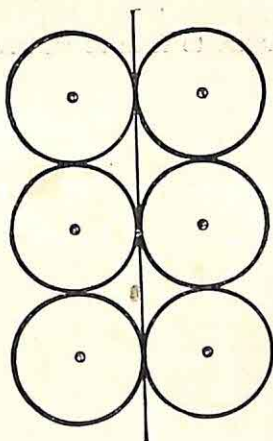



FIG. 3.

Exercise XVII.

CLAY MODELLING—SPHERE AND CUBE.

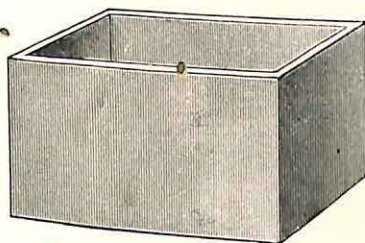
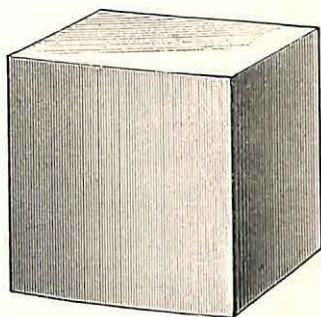
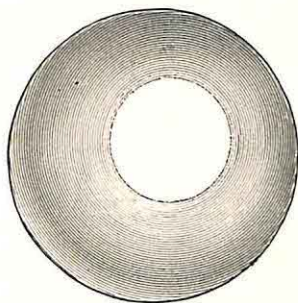
MATERIALS.—*Moist clay; modelling board; two flat (square) pieces of wood; damp sponge.* [*Large cube as model.*]

Roll clay into sphere.

Gently press and knock clay sphere on modelling board, to produce flat faces similar to those of cube.

Use flat wooden blocks held parallel (one in each hand) to press clay into form of cube. (Show that there are three pairs of parallel faces on the cube used as a model.)

Make edges and corners of cube as sharp as possible by use of blocks.

Model clay with fingers to form as well as possible a hollow box.

Exercise XVIII.

CLAY MODELLING—DIVISIONS OF SPHERE.

MATERIALS.—*Moist clay ; modelling board ; thin string for cutting clay ; slate and pencil ; damp sponge.* [*Large apple or orange of regular shape as a mode.*]

Roll clay into sphere.

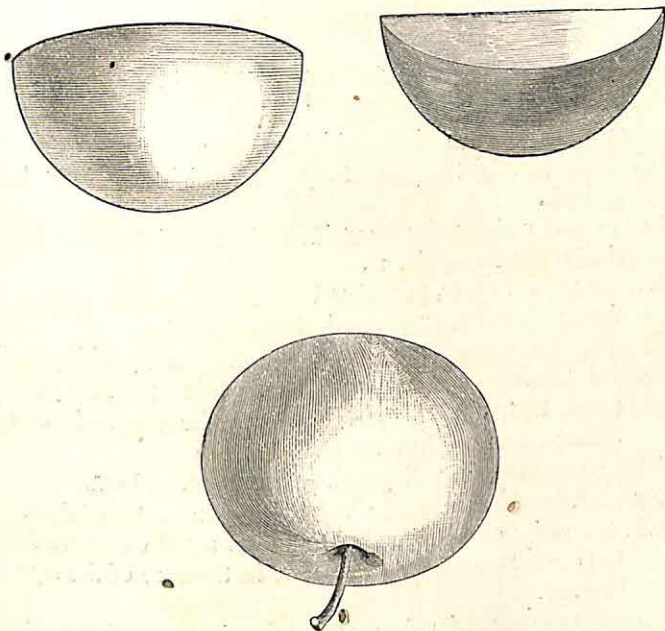
Cut clay sphere, by thin string, into two hemispheres.

Lay one hemisphere on its flat face on the slate, and trace its circular outline.

Cut other hemisphere into two equal parts with string.

Lay one quarter so produced on one of its flat faces, and trace outline ; then do the same with the other face.

Make up clay again into one piece (moistening the faces of the pieces if necessary).

Make model of apple or orange. (First direct attention to manner in which the fruit differs from a perfect sphere.)

Exercise XIX.

PARALLEL RULING—SIMILAR FIGURES.

MATERIALS.—*Small white paper square; slate and pencil; ruler; scissors.*

Lay square symmetrically in middle of slate.

Rule lines parallel to edges of square, and distant about half an inch.

Rule second series of lines outside and parallel to first, and at similar distance (Fig. 1).

Remove paper square, note that lines drawn form two squares, then replace paper square in former position.

Mark position of corners of paper square carefully with pencil.

Remove paper square and rule lines joining marked points. (Note that, if all accurately drawn, the diagonals of all three squares are in same straight line.)

Fold square along one diagonal, crease there, and cut.

Lay one triangle so formed symmetrically in centre of slate.

Rule two series of lines parallel to and at equal distances from the central triangle, as was done in the case of the square (Fig. 2).

Remove the paper triangle, examine drawings, and then replace paper in former position.

Mark corners of paper triangle, remove and rule lines joining points.

[If there were time, one of these sets of lines might be drawn freehand.]

FIG. 1.

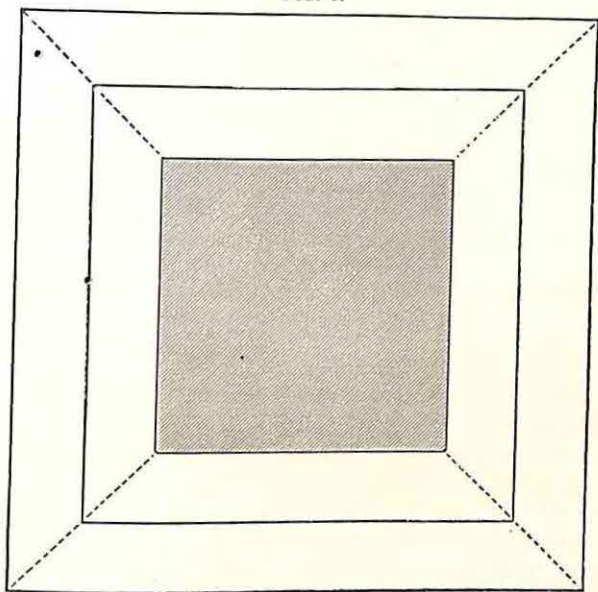
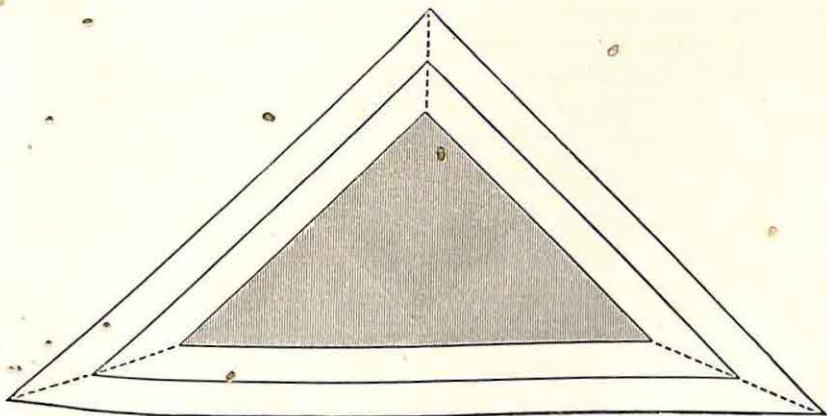



FIG. 2.

Exercise XX.

COLOUR SORTING.

MATERIALS.—*Series of pieces of coloured wool in bag* (see Note E, p. 5); *large white paper square to lay wools on.* [*Teacher's corresponding set of coloured skeins.*]

Select from bag piece of wool of same colour and shade as specimen skein shown. (Use a very distinct colour at first. Lay the specimen by the side of the piece selected by the child, and ask him to say whether they are exactly alike.)

Repeat with several other colours in succession.

Pick out from the full series of wools all the pieces which could be called red, blue, yellow, etc.

Select from the reds or blues the very light and the very dark ones, and arrange the series in order of shade.

Lay together, or twist loosely together, two pieces selected by teacher which go well together.

Similarly put together two pieces which do not harmonize well.

Let child select a piece similar to specimen shown, and then himself find a second colour to go well with first.

NOTE.—This exercise might with advantage be repeated several times at intervals.

Exercise XXI.

PAPER CUTTING AND MOUNTING (PLATE I.).

MATERIALS.—*Large white paper square; two differently coloured gummed paper squares (to look well together); scissors; lead pencil; rule; damp sponge.*

Lay one coloured square partly over the other on the white square to see whether the colours look well together.

Rule faintly the diagonals of the white paper square.

Lay one coloured square symmetrically in middle of white square. (Note that its corners will be on the diagonals and its sides parallel to those of larger square.)

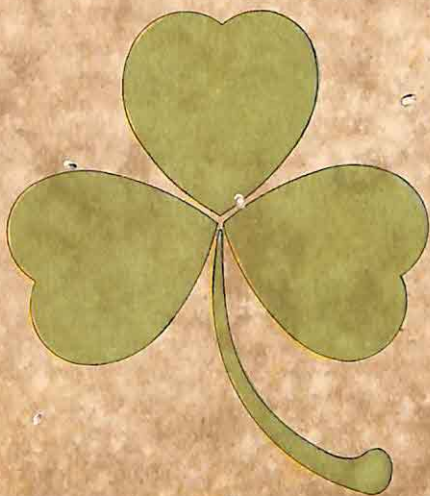
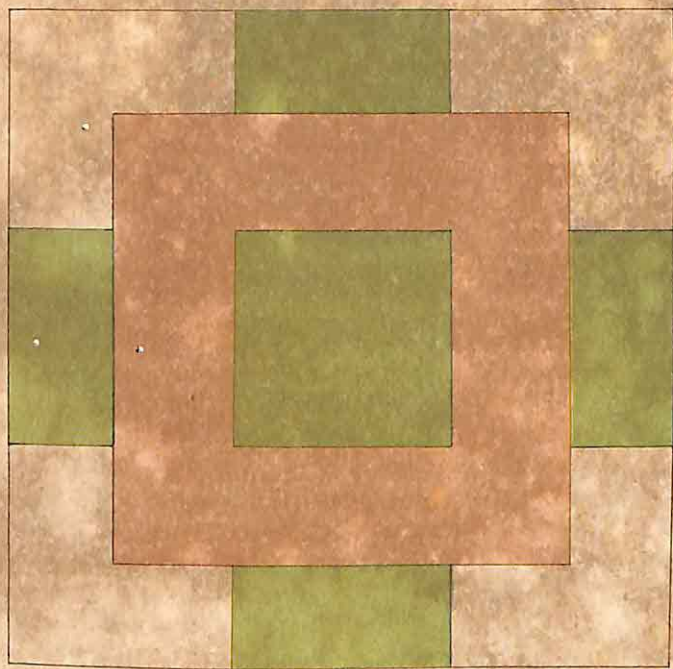
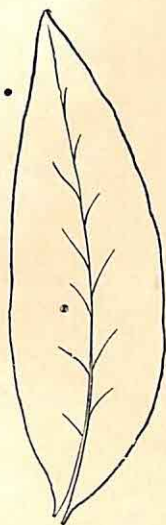
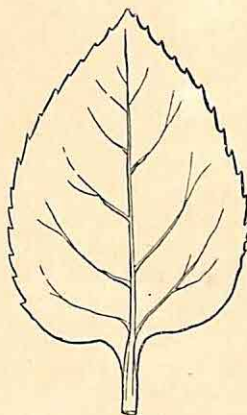
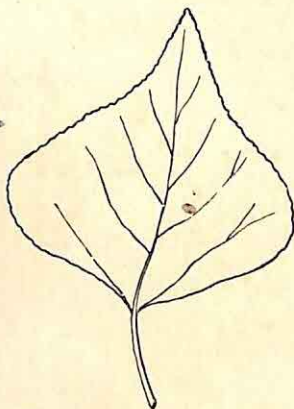
Moisten the gum and fasten down coloured square in position. (*See Note D, p. 4.*)

Mark points on other coloured square (on gummed side, if the other does not show pencil marks well), at distance of one inch from each corner, and rule lines joining marked points.

Cut along the ruled lines to leave central square. (The measuring, ruling, and cutting must be very carefully done, as also the mounting, since the finished exercise will test the accuracy of the work.)

Lay small coloured square just cut in centre of, and with sides parallel to, mounted square. (This may be tested by laying the rule along the diagonals of the three squares, which should all coincide.)

Moisten gum and fasten down small square.

Cut from the coloured strips left from second coloured square pieces having length equal to side of central square, and mount as in Fig. 1, Plate ii.

(See Exercise XIII.)

Exercise XXII.

DRAWING ON SQUARED PAPER.

MATERIALS.—*Squared paper; lead pencil; scissors.* [*Copy of leaf outline.*]

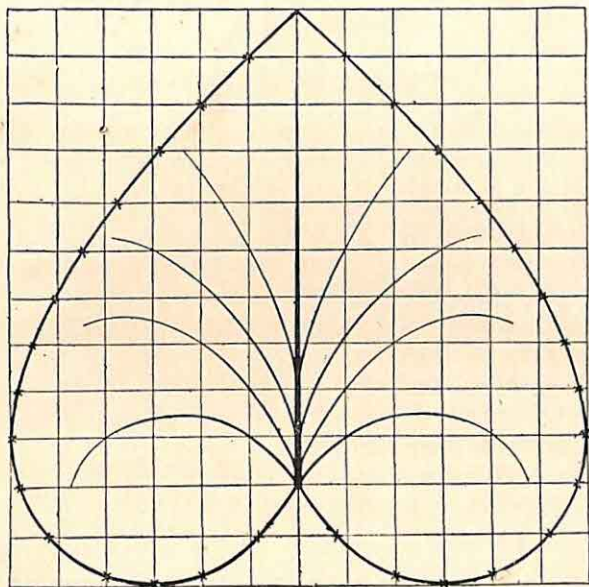
[NOTE.—The squares on the paper used by the children should be quarter inches, but the teacher could get squared cardboard with inch squares on which to draw copies to be placed in front of the class. Some dried and pressed leaves of fairly large size and simple shape would be useful in this and some of the following exercises.]

Draw lightly a square of three inches (twelve small squares) side on the squared paper.

Draw lightly the middle line from top to bottom of square.

Copy outline of leaf by help of squares (first marking points where outline crosses each line of squares).

Cut out with scissors when neatly drawn.

Mark in midrib and some of the veins.

Exercise XXIII.

PAPER CUTTING—LEAVES.

MATERIALS.—*Small white paper square; coloured paper square; ruler; lead pencil; scissors.* [*Pressed and mounted or fresh leaves.*]

Find middle points of two opposite edges of white square, and rule line joining the two points.

Draw from actual leaf, or from copy drawn on blackboard, outline of one side of simple leaf (Fig. 1).

Fold paper carefully along middle line (with drawing outside), and press down flat.

Cut through the doubled paper along the drawn curve.

Open out the piece cut to show form of leaf, and mark with pencil midrib and some veins.

Proceed in same way as above on back of coloured paper to draw outline of somewhat differently shaped leaf (Fig. 2), and cut out.

NOTE.—In repeating the Exercise, the children might try to reproduce the general outlines of some simple mounted leaves (see figures on p. 47).

FIG. 1.

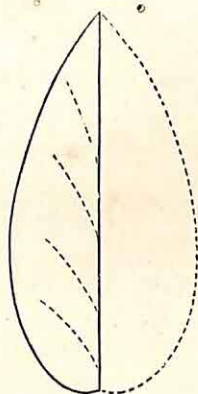
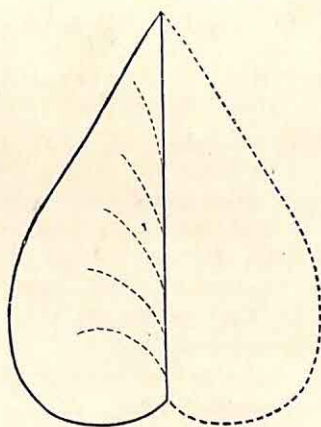



FIG. 2.

Exercise XXIV.

PAPER CUTTING AND MOUNTING (PLATE II.).

MATERIALS.—*Large white paper square; small white paper square; coloured gummed paper square (green by preference); scissors; ruler; lead pencil; damp sponge.* [*A mounted clover leaf would be useful to suggest the general arrangement.*]

Fold and cut the two small paper squares along middle lines, each into four squares (Fig. 1).

On one small white square outline and cut leaf (Fig. 1), as in Exercise XXIII., from copy on blackboard.

Repeat this drawing and cutting on the other small white squares till a well-shaped leaf is obtained.

With the best-shaped white leaf as pattern cut out three coloured leaves.

Lay the coloured leaves on the large square to form pattern of compound leaf, and mount in position (Fig. 2).

Outline a simple stalk with pencil, or cut out a curved coloured strip, and mount (Plate ii. Fig. 2).

FIG. 1.

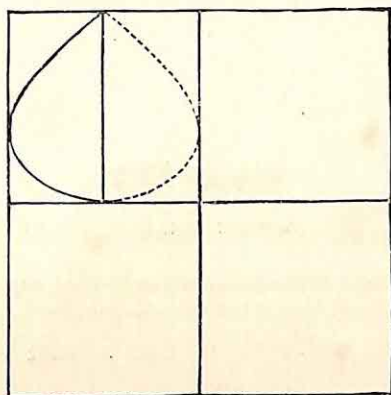
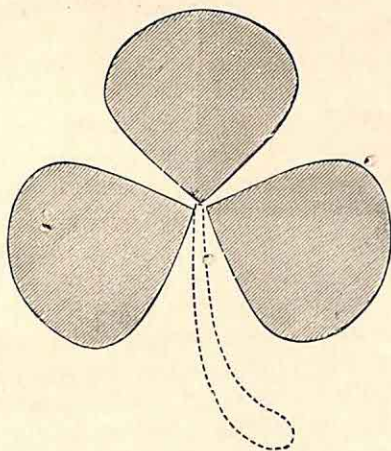



FIG. 2.

Exercise XXV.

WIRE MODELLING.

MATERIALS.—*Piece of thin wire about twenty inches long* (see Note F, p. 5); *rule; scissors; slate and pencil.*

Straighten out wire, if necessary, and measure total length in inches.

Make wire into small coil without twisting the end.

Draw with rule on slate letter L, having longer arm two inches and shorter one inch.

Cut off piece of wire required to make letter L same size, straighten and bend at right angles. (In bending the wire, hold tightly between thumb and forefinger, and bend over thumb-nail.)

Rule figure on slate similar to Fig. 2, each line being one inch long.

Calculate length of wire required to make similar figure, cut off, straighten, and bend at proper points.

Rule letter V on slate, each arm being two inches long.

Cut off length of wire required to make same letter, straighten and bend at middle point. (It will not be possible to make a very sharp bend at the angle, but the sides of the V should be kept straight.)

Lay the wire models over the drawings to see if they agree.

(With the remaining piece of wire the children might be allowed to make any other letter or object they pleased, first, however, drawing the figure on their slate.)

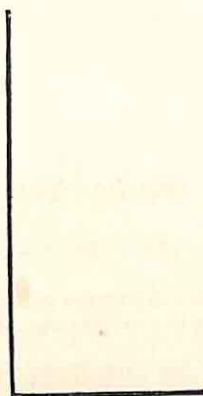
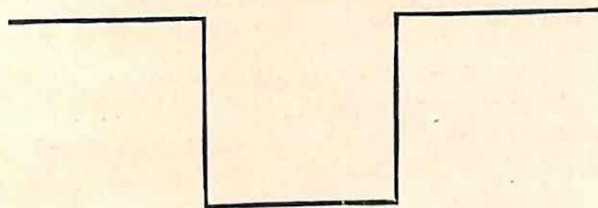
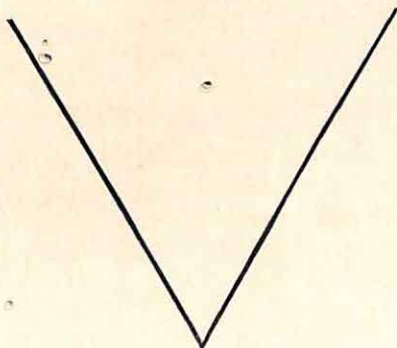



FIG. 1.
FIG. 2.
FIG. 3.

Exercise XXVI.

WIRE MODELLING—LETTERS.

MATERIALS.—*Coil of thin wire (or piece at least two feet long); scissors; rule; piece of white paper to lay wire on.*

Cut off four pieces of wire each six inches long, and straighten out.

Draw one piece between finger and thumb (or over slate frame) to give it a curved form, and model it into shape of C with small loop at end. (Make it so as to lie flat on desk.)

Estimate middle point of second piece; hold at estimated middle point and test with rule.

Bend each half of this second piece into curve to form letter S.

Find middle point of third piece as before, and bend at right angles there.

Bend half of the third piece into curve to form P twisting end round straight piece to fasten it.

Hold fourth piece at point, so that one part is twice as long as other, and test with rule; bend sharply at right angles there.

Bend longer portion of this fourth piece to form R; then convert to B.

C S
P R B

Exercise XXVII.

WIRE MODELLING—LEAVES.

MATERIALS.—*Piece of wire about thirty inches long; rule; scissors.*

Measure length of wire, and cut into lengths of six inches.

Draw wire between finger and thumb, or over slate frame, to give it a curved form.

Make one piece into a circle, as nearly as possible, fastening the ends by twisting them together.

With two other pieces make the outline of leaves of same shape as in Exercises XXII. and XXIII. (This might first be attempted from memory, and then if necessary from copy drawn on blackboard.)

Attach small piece of wire to leaves to represent stalks.

Make fourth piece of wire into object chosen by children themselves.

Exercise XXVIII.

CLAY MODELLING—LEAVES.

MATERIALS.—*Moist clay; modelling board; damp sponge; modelling tool.* (See Note H, p. 7.)

Divide clay into two approximately equal pieces.
Flatten out clay on board with fingers into approximate shape (and size) of one of the leaves of Exercise XXIII.
Finish off shape of leaf by aid of modelling tool.
Attach simple stalk, and mark in veins.
Similarly model other leaf of Exercise XXIII., or copy simple dried and mounted leaf shown.

NOTE.—A further exercise to model the group of three simple leaflets of Exercise XXIV. might follow the present one.

Exercise XXIX.

PAPER MOUNTING—CHIEF POINTS OF COMPASS (PLATE II.).

MATERIALS.—*Large white paper square; three differently coloured gummed squares (to go well together, one being light coloured for central square); rule; scissors; lead pencil; damp sponge.*

Find middle point of each edge of large paper square by means of rule, and mark.

Rule faint pencil lines joining opposite marked points; also rule faintly the diagonals.

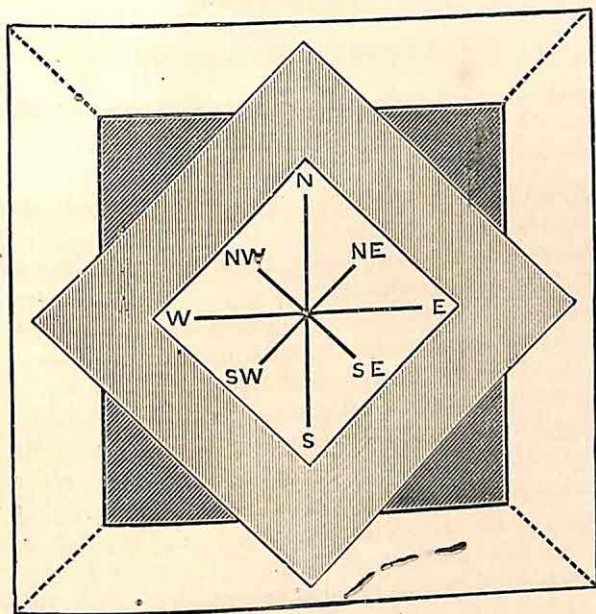
Mount one gummed square symmetrically, with corners on ruled diagonals of large square and sides parallel.

Mount second gummed square symmetrically over first, but with corners on ruled middle lines of large square.

Carefully fold third (light) coloured gummed square along middle lines to form four small squares. (One light-coloured square might therefore serve for four children.)

Mount small light-coloured square symmetrically in centre of, and with sides parallel to, last mounted square.

Rule lines on central square in direction of its diagonals, and also in direction of diagonals of first mounted square; leaving space sufficient for printing in letters N, E, S, W. (Print also letters for intermediate points N.E., N.W., S.E., S.W., if children understand them.)

N
NW
NE
W
E
SW
SE
S

Exercise XXX.

DRAWING, PAPER-CUTTING AND MOUNTING.

MATERIALS.—*Large white paper square; three differently coloured gummed paper squares; squared drawing paper; lead pencil; scissors; damp sponge.*

Draw on squared drawing paper from dictation a square with $3\frac{1}{2}$ inches (14 squares) side.
Draw lines joining middle points of sides of square thus drawn.
Draw smaller square inside and with sides parallel to those of second. (The position of this third square might be left to the children themselves to determine; or they might be told to make its corners at a distance of three squares from the corners of the second square.)
Cut out largest square from the drawing, and, using it as a pattern, cut similar piece from one of coloured squares.
From the large square first cut from the drawing, cut out next largest square, and use it as a pattern to cut similar piece from second coloured square.
Repeat same steps with smallest square.
Lay coloured squares so cut [illegible] each other on white square, so as to reproduce the pattern of the drawing.
Mount the coloured squares in position.